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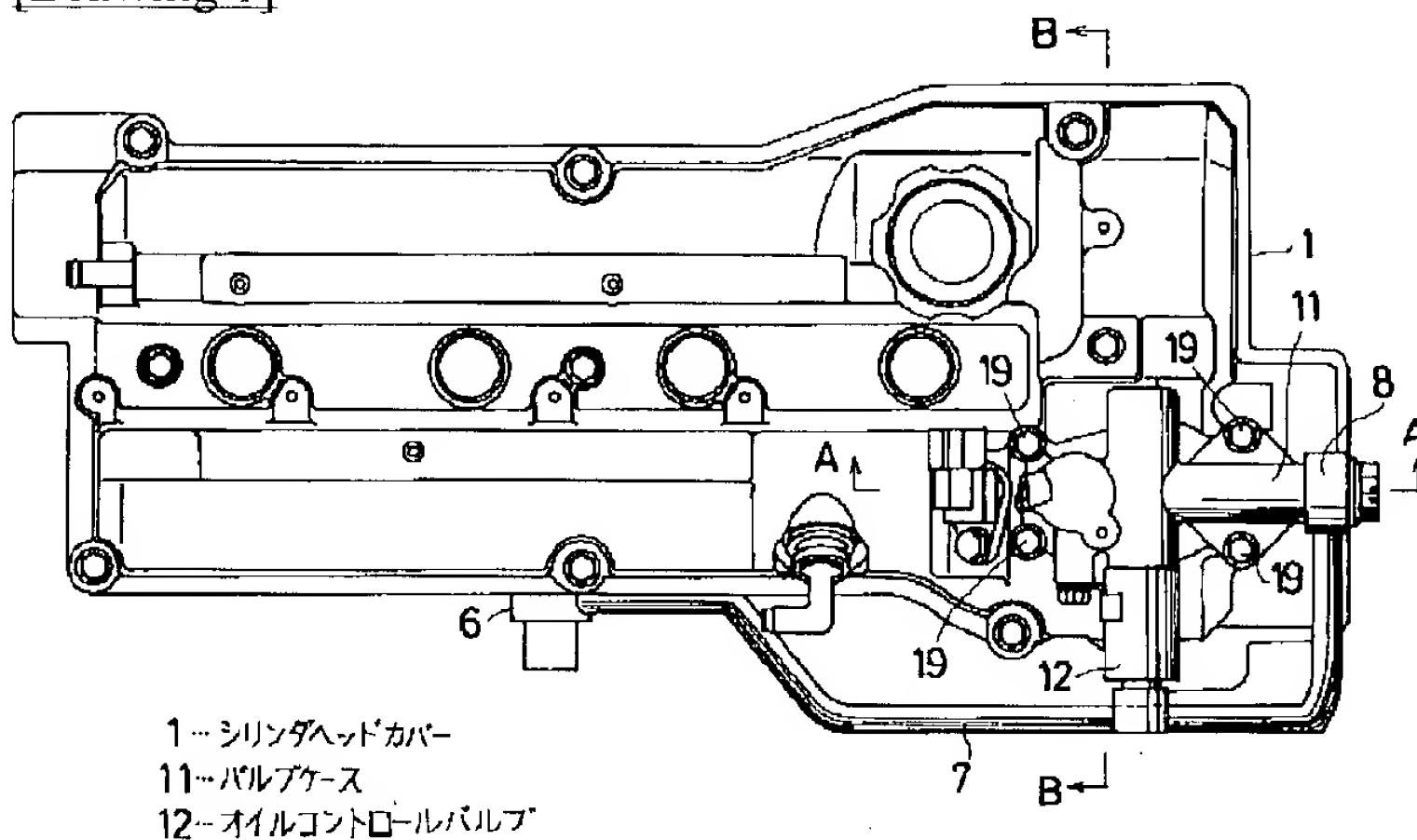
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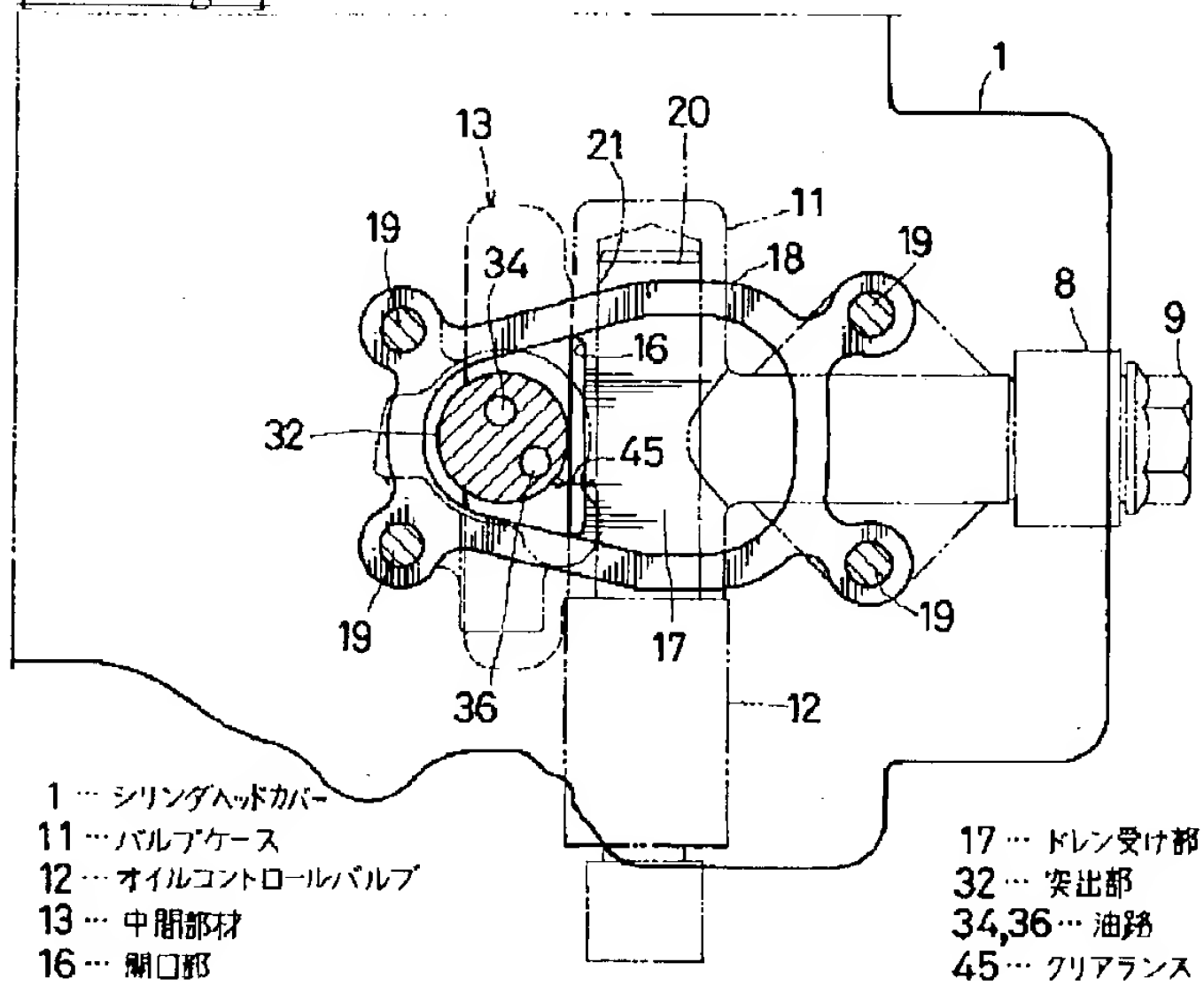
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DRAWINGS

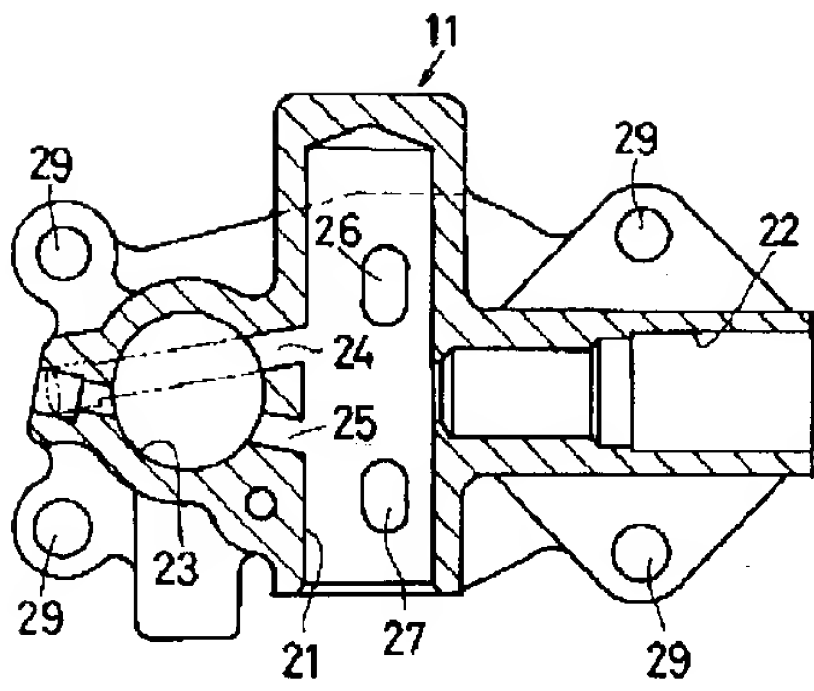
[Drawing 1]



[Drawing 2]

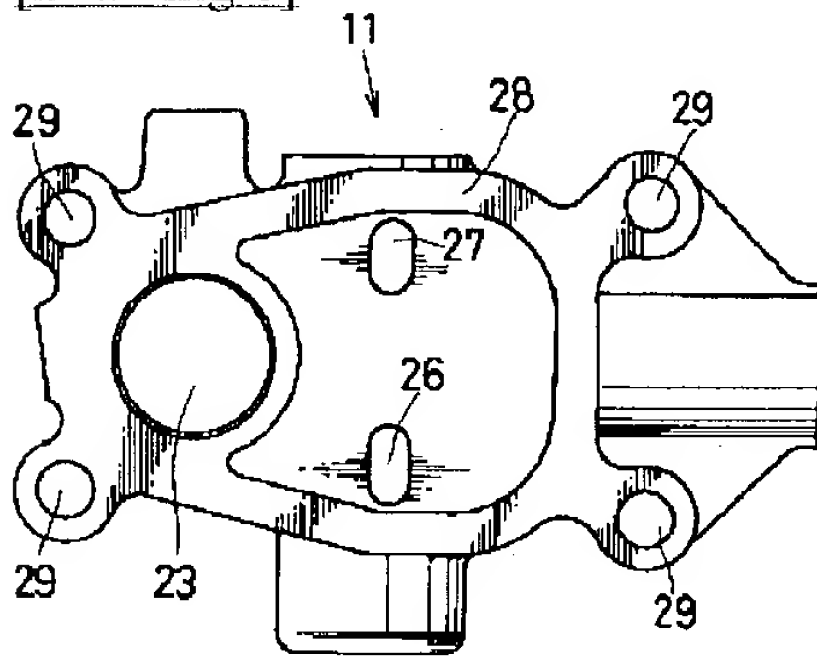


[Drawing 5]



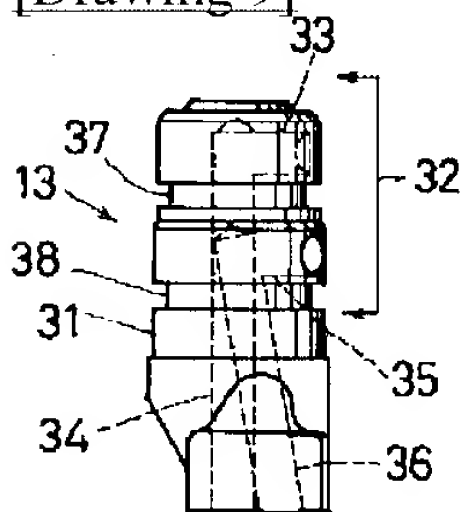
11... バルブケース 24,25... 油路
23... 嵌挿部 26,27... ドレン通路

[Drawing 6]



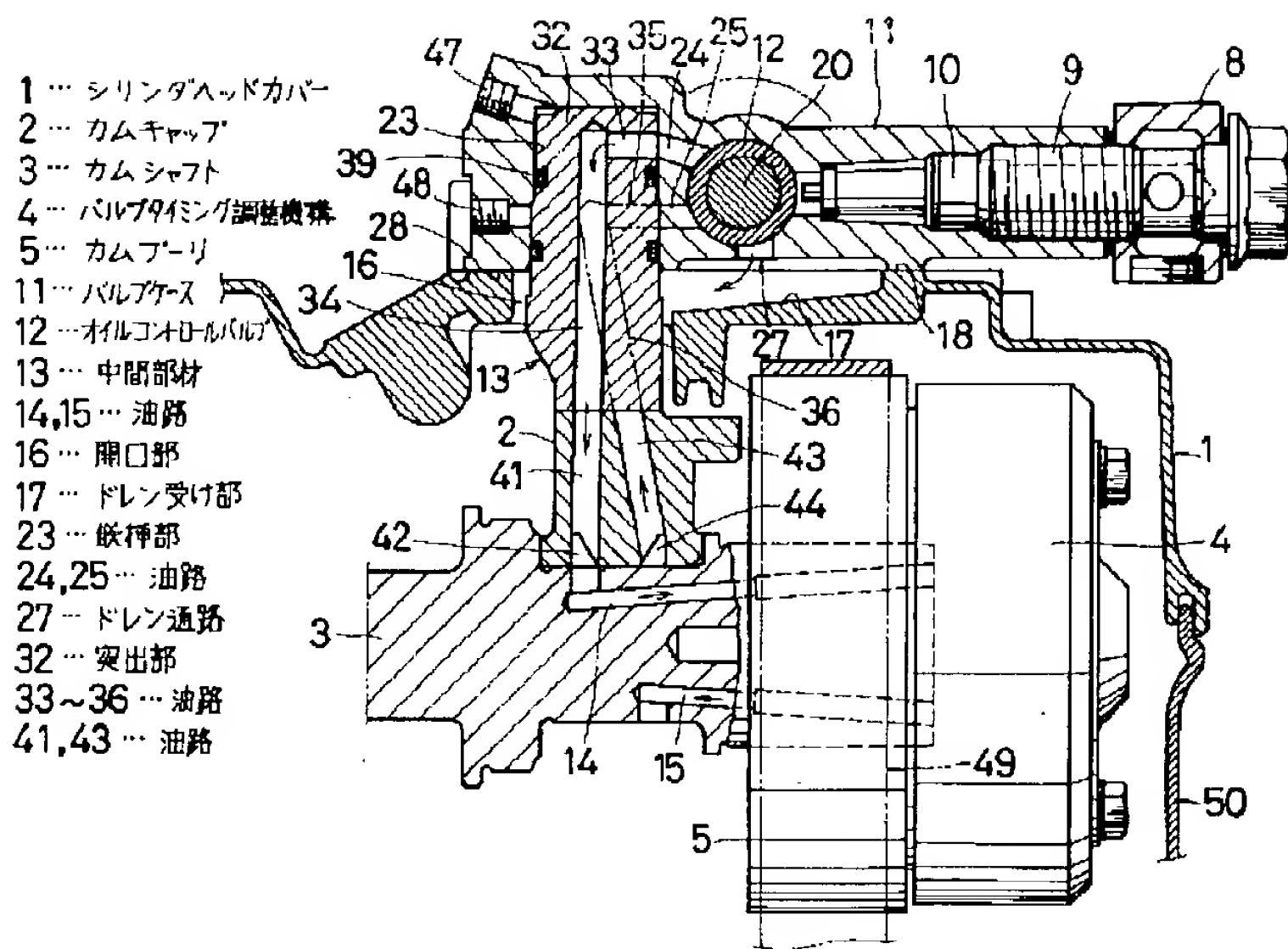
11... バルブケース
23... 嵌挿部
26,27... ドレン通路

[Drawing 9]

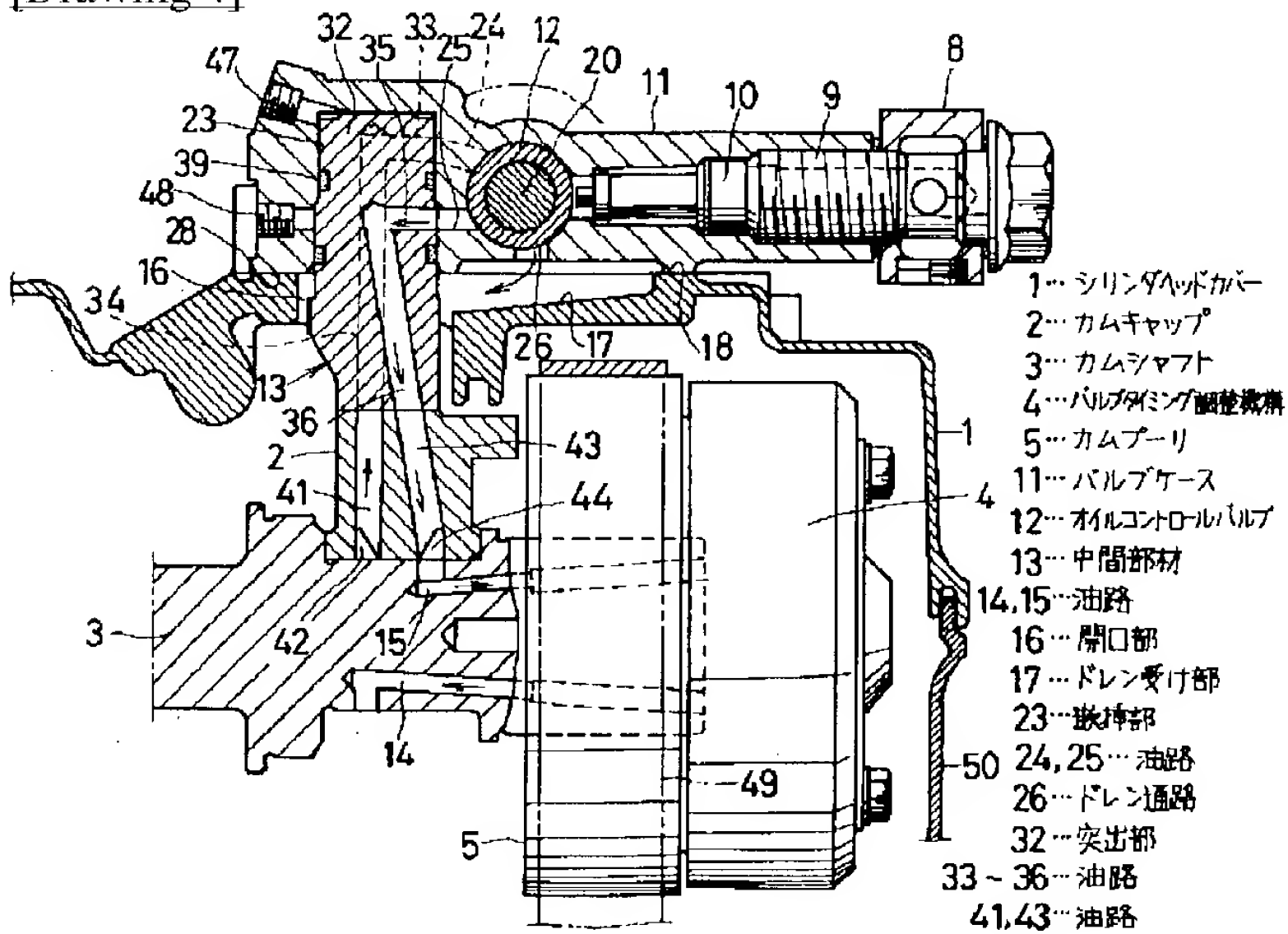


13... 中間部材
32... 突出部
33~36... 油路

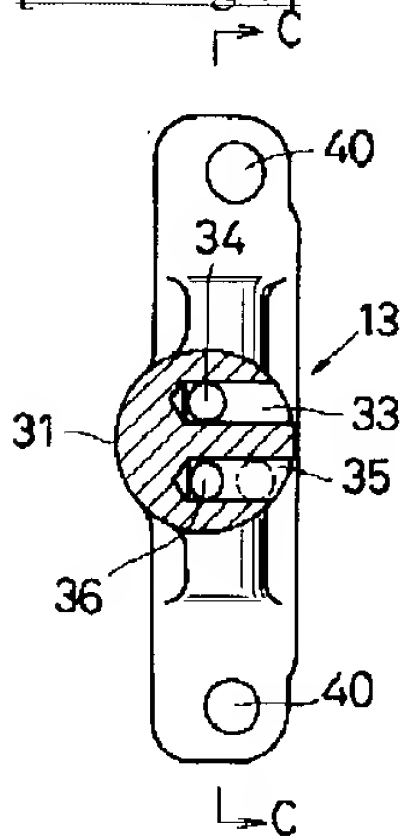
[Drawing 3]



[Drawing 4]



[Drawing 8]



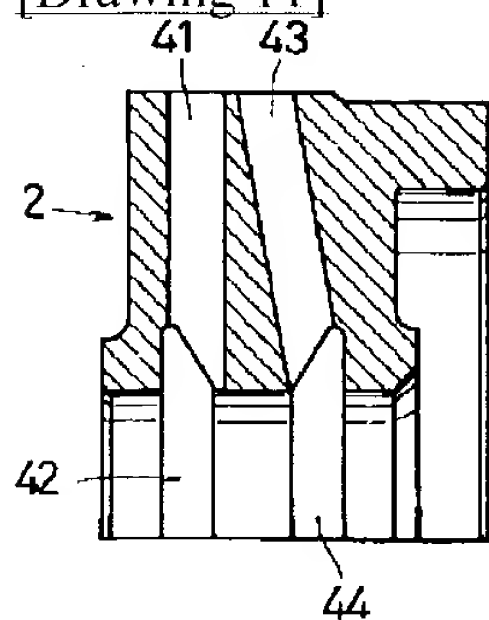
h

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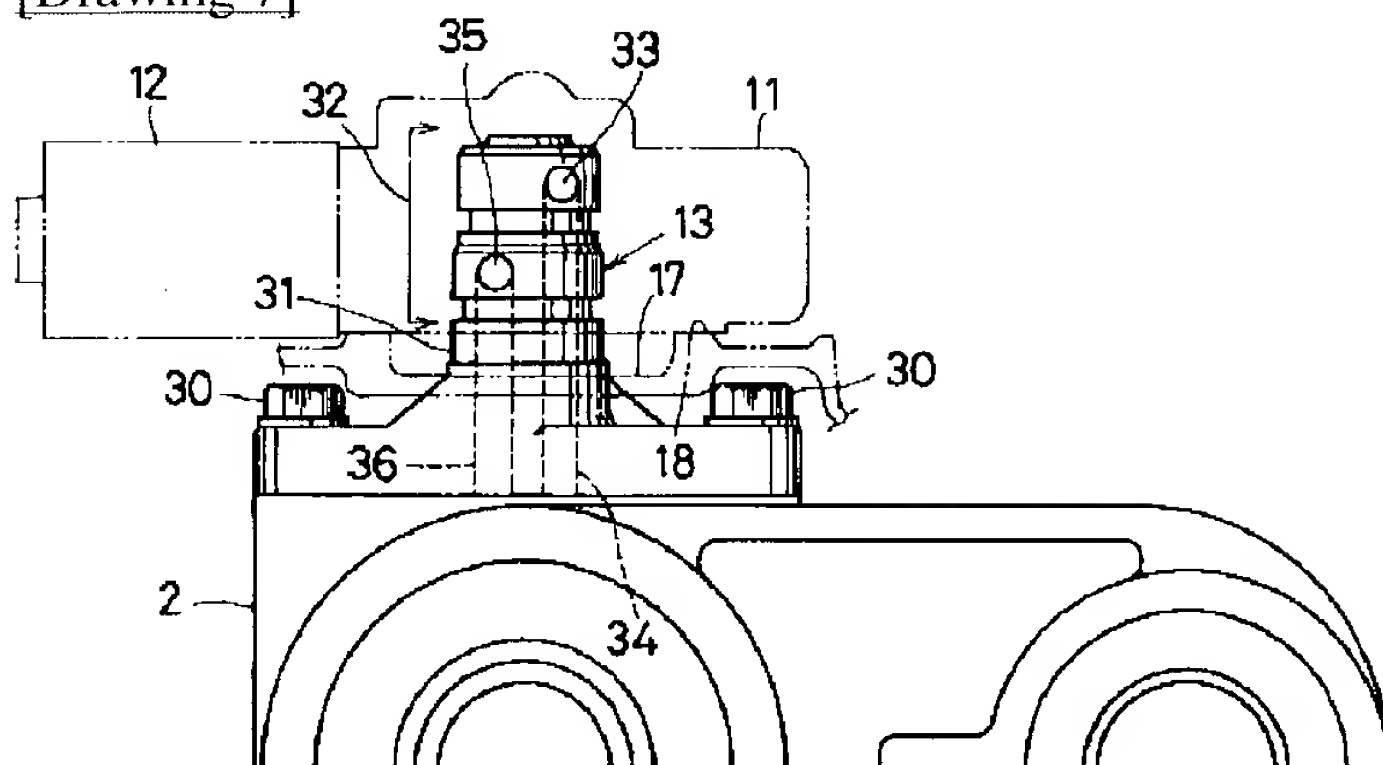
eb cg e e

[Drawing 11]



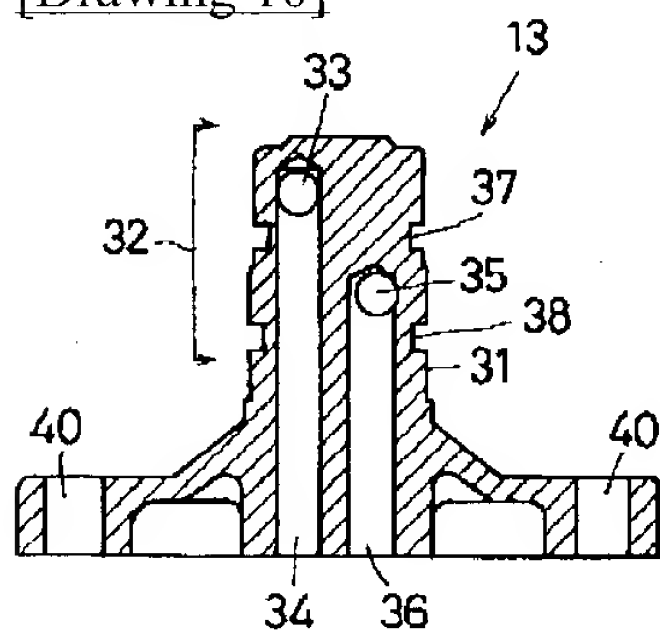
2… カムキャップ
41,43… 油路

[Drawing 7]



2… カムキャップ 17… ドレン受け部
11… バルブケース 32… 突出部
12… オイルコントロールバルブ 33~36… 油路
13… 中間部材

[Drawing 10]



13… 中間部材
33~36… 油路

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] Valve timing equipment of the internal combustion engine with which it is an internal combustion engine's adjustable valve timing equipment, opening was formed in the upper wall of a cylinder head cover, and the oilway which opens an oil control valve and a valve timing adjustment device for free passage with a wrap from a cylinder head cover top-face side using the above-mentioned opening was formed in the above-mentioned opening by the valve case which contained the above-mentioned oil control valve characterized by providing the following The valve timing adjustment device in which the actuation timing of a bulb is adjusted The oil control valve which is prepared in the oil pressure path over the above-mentioned valve timing adjustment device, controls oil pressure, and adjusts valve timing

[Claim 2] The actuation timing of the above-mentioned bulb is adjustable valve timing equipment of the internal combustion engine according to claim 1 which it is adjusted [internal combustion engine] with the oil pressure which circulates the inside of a cam shaft, and the above-mentioned valve case is arranged [internal combustion engine] corresponding to the upper part of the cam cap which supports the above-mentioned cam shaft to revolve, and made the above-mentioned oil control valve and the oilway formed in the cam cap open for free passage.

[Claim 3] Adjustable valve timing equipment of the internal combustion engine according to claim 2 which the oilway configuration member which penetrates the above-mentioned opening on the above-mentioned cam cap, and projects was prepared [internal combustion engine], and the fit-in section in which the lobe of the above-mentioned oilway configuration member is fitted was prepared [internal combustion engine] in the inferior-surface-of-tongue side of the above-mentioned valve case, and made the oil control valve and the oilway in an oilway configuration member open for free passage.

[Claim 4] Adjustable valve timing equipment of the internal combustion engine according to claim 3 with which an oil control valve and the above-mentioned fit-in section were put side by side in accordance with the upper wall configuration of a cylinder head cover in the above-mentioned valve case.

[Claim 5] Adjustable valve timing equipment of the internal combustion engine according to claim 3 or 4 which the above-mentioned oilway configuration member is arranged [internal combustion engine] on the top face of a cam cap, and made the oilway and the oilway of an oilway configuration member open for free passage in a cam cap.

[Claim 6] Adjustable valve timing equipment of the internal combustion engine according to claim 1, 2, 3, 4, or 5 with which the valve timing adjustment device in which the rotation phase of the cam pulley and cam shaft which were prepared in the periphery of the above-mentioned cam shaft was changed was prepared in the end side of a cam shaft, and the above-mentioned valve case has been arranged at the arrangement [of this valve timing adjustment device], and ** side.

[Claim 7] Adjustable valve timing equipment of the internal combustion engine according to claim 3, 4, 5, or 6 which establishes the drain path of an oil control valve in a valve-case inferior surface of tongue, forms the drain receptacle section in the above-mentioned drain path and the cylinder head cover which counters, and flows back the oil of the drain receptacle section in the cylinder head or covering through the path clearance between the above-mentioned opening and an oilway configuration member.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the adjustable valve timing equipment of an internal combustion engine which the rotation phase of the cam pulley and cam shaft which were prepared in the periphery of a cam shaft is changed, and adjusts the actuation timing of a bulb (induction-exhaust valve) to a tooth-lead-angle or lag side with the actuation load of the oil pressure which circulates for example, the inside of a cam shaft.

[0002]

[Description of the Prior Art] Conventionally, as an above-mentioned internal combustion engine's adjustable valve timing equipment, the equipment of a publication is in JP,8-4510,A. Namely, the valve timing adjustment device in which change the rotation phase of the timing pulley and cam shaft which were prepared in the periphery of a cam shaft, and the actuation timing of a bulb (induction-exhaust valve) is adjusted with the oil pressure which circulates the inside of a cam shaft, It has the oil control valve which is prepared into the oil pressure path over this valve timing adjustment device, controls oil pressure, and adjusts valve timing. It is adjustable valve timing equipment of the internal combustion engine which installed the above-mentioned oil control valve in the cylinder head cover on the cam cap top face.

[0003] When the space in an above-mentioned cylinder head cover was large enough, the oil control valve could be contained in the cylinder head cover like ****, but generally, when the space in a cylinder head cover was narrow, it was difficult to contain an oil control valve in this covering and it tended to contain the above-mentioned oil control valve in the cylinder head cover for this reason, the cylinder head cover needed to be enlarged, the space for oil control-valve receipt needed to be secured, and there was a trouble which a cylinder head cover enlarges.

[0004]

[Problem(s) to be Solved by the Invention] Above-mentioned opening by the valve case which invention of this invention according to claim 1 formed opening in the upper wall of a cylinder head cover, and contained the oil control valve with a wrap from a cylinder head cover top-face side By forming the oilway which opens an oil control valve and a valve timing adjustment device for free passage using this opening Installation of an oil control valve can be performed without enlarging this cylinder head cover in any way, even if it is, when the space in a cylinder head cover is narrow. Moreover, in management of an oilway (oil path) becoming easy, it aims at offer of the adjustable valve timing equipment of the internal combustion engine which can attain miniaturization of an oil pressure response disposition top and a cylinder head cover.

[0005] Invention of this invention according to claim 2 combines with the purpose of invention of the claim 1 above-mentioned publication, arranges a valve case corresponding to the upper part of the cam cap which supports a cam shaft to revolve, by making an oil control valve and the oilway formed in the cam cap open for free passage, aims at die-length compaction of an oilway, and aims at offer of the adjustable valve timing equipment of the internal combustion engine which can raise oil pressure responsibility further.

[0006] Invention of this invention according to claim 3 combines with the purpose of invention of the

claim 2 above-mentioned publication. By preparing the oilway configuration member which penetrates above-mentioned opening and projects in a cam cap, preparing the fit-in section which fits in the lobe of an oilway configuration member in the inferior-surface-of-tongue side of a valve case, and making an oil control valve and the oilway in an oilway configuration member open for free passage It aims at offer of the adjustable valve timing equipment of the internal combustion engine which can secure the positioning nature of an oilway configuration member and a valve case by both above-mentioned lobe and fit-in section.

[0007] Invention of this invention according to claim 4 combines with the purpose of invention of the claim 3 above-mentioned publication, and aims at offer of the adjustable valve timing equipment of the internal combustion engine which can attain miniaturization of the height direction by installing an oil control valve and the above-mentioned fit-in section in accordance with the upper wall configuration of a cylinder head cover in an above-mentioned valve case.

[0008] Invention of this invention according to claim 5 combines with the purpose of invention above-mentioned claim 3 or given in four, arranges an above-mentioned oilway configuration member on the top face of a cam cap, by making the oilway in a cam cap, and the oilway in an oilway configuration member open for free passage, aims at large die-length compaction of an oilway, and aims at offer of the adjustable valve timing equipment of the internal combustion engine which can raise oil pressure responsibility further.

[0009] Invention of this invention according to claim 6 combines with the purpose of invention above-mentioned claims 1, 2, 3, and 4 or given in five. By preparing an above-mentioned valve timing adjustment device in the end side of a cam shaft, and arranging an above-mentioned valve case to the same side as the arrangement side of this valve timing adjustment device Shortest-ization of oilway die length is attained and it aims at offer of the adjustable valve timing equipment of the internal combustion engine which can raise oil pressure responsibility further.

[0010] Invention of this invention according to claim 7 combines with the purpose of invention above-mentioned claims 3, 4, and 5 or given in six. The drain path (return path) of an oil control valve is established in a valve-case inferior surface of tongue. Form the drain receptacle section in this drain path and the cylinder head cover which counters, and the oil of the drain receptacle section with constituting that it should flow back in a cylinder head cover through the path clearance between above-mentioned opening and an oilway configuration member While being able to make return oil (drain) flow back smoothly, it aims at offer of the adjustable valve timing equipment of the internal combustion engine which can accomplish above-mentioned opening with necessary minimum opening.

[0011]

[Means for Solving the Problem] The valve timing adjustment device in which invention of this invention according to claim 1 adjusts the actuation timing of a bulb, It is adjustable valve timing equipment of the internal combustion engine having the oil control valve which is prepared in the oil pressure path over the above-mentioned valve timing adjustment device, controls oil pressure, and adjusts valve timing. The above-mentioned opening by the valve case which formed opening in the upper wall of a cylinder head cover, and contained the above-mentioned oil control valve with a wrap from a cylinder head cover top-face side Valve timing equipment of the internal combustion engine with which the oilway which opens an oil control valve and a valve timing adjustment device for free passage using the above-mentioned opening was formed.

[0012] Invention of this invention according to claim 2 combines with the configuration of invention of the claim 1 above-mentioned publication, the above-mentioned valve case is arranged corresponding to the upper part of the cam cap which the actuation timing of the above-mentioned bulb is adjusted with the oil pressure which circulates a cam shaft, and supports the above-mentioned cam shaft to revolve, and it carries out that it is adjustable valve-timing equipment of the internal combustion engine which made the above-mentioned oil control valve and the oilway formed in the cam cap open for free passage as the description.

[0013] Invention of this invention according to claim 3 combines with the configuration of invention of the claim 2 above-mentioned publication, the oilway configuration member which penetrates the above-mentioned opening on the above-mentioned cam cap, and projects is prepared, the fit-in section by

which the lobe of the above-mentioned oilway configuration member is fitted in the inferior-surface-of-tongue side of the above-mentioned valve case prepares, and it carries out that it is adjustable valve-timing equipment of the internal combustion engine which made the oil control valve and the oilway in an oilway configuration member open for free passage as the description.

[0014] Invention of this invention according to claim 4 combines with the configuration of invention of the claim 3 above-mentioned publication, and is characterized by being adjustable valve timing equipment of the internal combustion engine with which an oil control valve and the above-mentioned fit-in section were put side by side in accordance with the upper wall configuration of a cylinder head cover in the above-mentioned valve case.

[0015] It combines with the configuration of invention above-mentioned claim 3 or given in four, the above-mentioned oilway configuration member is arranged on the top face of a cam cap, and invention of this invention according to claim 5 is characterized by being adjustable valve timing equipment of the internal combustion engine which made the oilway and the oilway of an oilway configuration member open for free passage in a cam cap.

[0016] It combines with the configuration of invention above-mentioned claims 1, 2, 3, and 4 or given in five, the valve-timing adjustment device in which the rotation phase of the cam pulley and cam shaft which were prepared in the periphery of the above-mentioned cam shaft is changed is prepared in the end side of a cam shaft, and invention of this invention according to claim 6 is characterized by to be adjustable valve-timing equipment of the internal combustion engine with which the above-mentioned valve case has been arranged at the arrangement [of this valve timing adjustment device], and ** side.

[0017] Invention of this invention according to claim 7 combines with the configuration of invention above-mentioned claims 3, 4, and 5 or given in six, establishes the drain path of an oil control valve in a valve-case inferior surface of tongue, forms the drain receptacle section in the above-mentioned drain path and the cylinder head cover which counters, and is characterized by to be adjustable valve-timing equipment of the internal combustion engine which flows back the oil of the drain receptacle section in the cylinder head or covering through the path clearance between the above-mentioned opening and an oilway configuration member.

[0018]

[Function and Effect of the Invention] According to invention of this invention according to claim 1, an above-mentioned valve timing adjustment device Although the actuation timing of a bulb (induction-exhaust valve) is adjusted, the oil control valve prepared in the oil pressure path over this valve timing adjustment device controls oil pressure and valve timing is adjusted Form opening in the upper wall of a cylinder head cover, and this opening is covered from a cylinder head cover top-face side by the above-mentioned valve case. Since the oilway which opens for free passage the oil control valve contained by the valve case and an above-mentioned valve timing adjustment device using above-mentioned opening was prepared Installation of an oil control valve can be performed without enlarging this cylinder head cover in any way, when the space in a cylinder head cover is narrow.

[0019] Moreover, since above-mentioned opening can be secured by the valve case, seal nature can be secured from a cylinder head cover top-face side by that of a wrap and the oilway free passage of an oil control valve and the valve timing adjustment device is moreover carried out using above-mentioned opening, management of an oilway becomes easy and it is effective in the ability to attain miniaturization of an oil pressure response disposition top and a cylinder head cover for this reason.

[0020] Since according to invention of this invention according to claim 2 it combined with the effect of the invention of the claim 1 above-mentioned publication, the above-mentioned valve case is arranged corresponding to the upper part of the cam cap which supports a cam shaft to revolve and ** was made to open an oil control valve and the oilway in a cam cap for free passage, die-length compaction of an oilway is aimed at and it is effective in the ability to raise oil pressure responsibility further at this rate.

[0021] Since the fit-in section which fits in the lobe of the oilway configuration member which combined with the effect of the invention of the claim 2 above-mentioned publication, and was prepared in the cam cap was prepared in the valve-case inferior-surface-of-tongue side according to invention of this invention according to claim 3 Since the positioning nature of an oilway configuration member and a valve case can be secured and an oil control valve and the oilway in an oilway configuration member

are made to open for free passage under a **** configuration, there is effectiveness it is ineffective to the seal nature between the oilway being easy.

[0022] Since according to invention of this invention according to claim 4 it combined with the effect of the invention of the claim 3 above-mentioned publication and an oil control valve and the above-mentioned fit-in section were installed in accordance with the upper wall configuration with a cylinder head cover in the above-mentioned valve case, it is effective in the ability to attain miniaturization of the height direction of a valve case.

[0023] Since according to invention of this invention according to claim 5 it combined with the effect of the invention above-mentioned claim 3 or given in four, the above-mentioned oilway configuration member is arranged on the top face of a cam cap and the oilway in a cam cap and the oilway in an oilway configuration member were made to open for free passage Large compaction of the die length of the whole oilway which opens an oil control valve and a valve timing adjustment device for free passage through the inside of a cam shaft can be aimed at, and it is effective in the ability to raise oil pressure responsibility further.

[0024] According to invention of this invention according to claim 6, it combines with an effect of the invention above-mentioned claims 1, 2, 3, and 4 or given in five. The above-mentioned valve timing adjustment device in which the rotation phase of the cam pulley and cam shaft which were prepared in the periphery of a cam shaft is changed is prepared in the end side of a cam shaft. Since the above-mentioned valve case has been arranged to the arrangement [of this valve timing adjustment device], and ** side on the cylinder head cover top face, shortest-ization of oilway die length can be attained and it is effective in the ability to raise oilway responsibility further.

[0025] According to invention of this invention according to claim 7, it combines with an effect of the invention above-mentioned claims 3, 4, and 5 or given in six. The drain path of an oil control valve is established in the inferior surface of tongue of a valve case. Since the drain receptacle section was formed in this drain path and the cylinder head cover which counters and the oil of the drain receptacle section was constituted through the path clearance between above-mentioned opening and an oilway configuration member that it should flow back in a cylinder head cover While being able to make return oil (drain) flow back smoothly, above-mentioned opening is accomplished with necessary minimum opening, and it is effective in the ability to plan a seal disposition top.

[0026]

[Example] One example of this invention is explained in full detail based on a drawing below. The drawing showed an internal combustion engine's adjustable valve timing equipment, formed the cam shaft 3 supported to revolve with the cam cap 2 in the interior of a cylinder head cover 1 in drawing 1 , drawing 2 , drawing 3 , and drawing 4 , and as shown in drawing 3 and drawing 4 , it has formed the valve timing adjustment device 4 in the end side of this cam shaft 3.

[0027] With the actuation load of the oil pressure which circulates the inside of a cam shaft 3, this valve timing adjustment device 4 changes the rotation phase of the cam pulley 5 (timing pulley) and cam shaft 3 which were prepared in the end section periphery of a cam shaft 3, and adjusts the actuation timing of a bulb (induction-exhaust valve) to a tooth-lead-angle or lag side.

[0028] The path in the oil joint 6 which shows above-mentioned oil pressure to drawing 1 from the oil gallery in a cylinder block (not shown), an oil pipe 7, the oil joint 8, and the union bolt 9 shown in drawing 3 , It results in the drive type oil control valve 12. the electromagnetism contained by the valve case 11 through the oil filter 10 -- After an oil pressure control (flow rate directional control) is carried out with this oil control valve 12 A cam shaft 3 is supplied through the pars intermedia material 13 (the so-called adapter) and cam KYABBU 2 as an oilway configuration member, and the valve timing adjustment device 4 is supplied through the oilways 14 and 15 formed in this cam shaft 3.

[0029] Since the valve case 11 which contained the above-mentioned oil control valve 12 in this example is arranged on the top face of a cylinder head cover 1 at an arrangement [of the valve timing adjustment device 4], and ** side, opening 16 is formed as shown in the cam cap 2 of this cylinder head cover 1, and the upper wall which counters at drawing 2 and drawing 3 .

[0030] Moreover, the drain receptacle section 17 prolonged in the upper part side of the cam pulley 5 following opening 16 is really formed in the above-mentioned cylinder head cover 1, and the annular

bearing surface 18 is formed in the top deck side of a cylinder head cover 1 so that these openings 16 and the drain receptacle section 17 may be surrounded. The valve case 11 fixed to this bearing surface 18 by using four set bolt 19 -- is constituted as shown in drawing 5 and drawing 6 .

[0031] That is, the spool arrangement hole 21 which contains the spool 20 of the oil control valve 12 possible [sliding] into the central part of a valve case 11 is formed in the direction between cam shafts, and the inlet hole 22 is formed so that it may intersect perpendicularly with this spool arrangement hole 21. As shown in this inlet hole 22 at drawing 3 and drawing 4 , the union bolt 9 and an oil filter 10 are installed inside. Moreover, it is formed in the anti-inlet hole side which separated the spool arrangement hole 21 of the above-mentioned valve case 11 that the fit-in section 23 prolonged in the vertical direction should carry out opening to an inferior-surface-of-tongue side, and this fit-in section 23 and the spool arrangement hole 21 are installed in the direction of a cam shaft in accordance with the upper wall configuration of a cylinder head cover 1.

[0032] And while two oilways 24 and 25 which open the above-mentioned fit-in section 23 and the above-mentioned spool arrangement hole 21 for free passage are formed, two drain paths 26 and 27 of the oil control valve 12 are formed in the lower part of the spool arrangement hole 21, and each of these drain paths 26 and 27 counter with the above-mentioned drain receptacle section 17. Moreover, the mounting eye 28 is formed in the base of the above-mentioned valve case 11 so that it may correspond with the bearing surface 18 of a cylinder head cover 1, and the above-mentioned opening 16 is covered from the top-face side of a cylinder head cover 1 by this valve case 11 that contained the oil control valve 12. In addition, in drawing 5 and drawing 6 , 29 is a through tube for making the above-mentioned set bolt 19 insert in.

[0033] On the other hand, as shown also in drawing 7 , the reverse T character-like pars intermedia material 13 is arranged on the top face of the above-mentioned cam cap 2 using two set bolts 30 and 30. As that oilway configuration section 31 shows this pars intermedia material 13 to drawing 3 and drawing 4 , the lobe 32 which penetrated the opening 16 of a cylinder head cover 1, and was projected up more nearly up than a projection and this opening 16 is fitted in the fit-in section 23 of a valve case 11.

[0034] This pars intermedia material 13 is equipped with the sideways oilway 33 which is open for free passage to one oilway 24 (refer to drawing 3 and drawing 5) of a valve case 11 as shown in drawing 7 , drawing 8 , drawing 9 , and drawing 10 , the oilway 34 which is open for free passage to this oilway 33, and is prolonged in the vertical direction, the sideways oilway 35 which is open for free passage to the oilway 25 (refer to drawing 4 and drawing 5) of another side of a valve case 11, and the oilway 36 which is open for free passage to this oilway 35, and is prolonged in a slanting lower part.

[0035] Moreover, the O ring arrangement sections 37 and 38 as a seal member are formed in the lower region outside periphery of the part in which the oilways 33 and 35 sideways [above-mentioned] were formed, and as shown in these O ring each arrangement sections 37 and 38 at drawing 3 and drawing 4 , O rings 39 and 39 are arranged. In addition, in drawing 8 and drawing 10 , 40 is a through tube for making the above-mentioned set bolt 30 insert in.

[0036] On the other hand on the cam cap 2 which supports the above-mentioned cam shaft 3 to revolve The oilway 41 prolonged in the vertical direction in order to make one oilway 34 in the pars intermedia material 13, and one oilway 14 in a cam shaft 3 open for free passage as shown in drawing 3 , drawing 4 , and drawing 11 , The oilway 43 prolonged in the slanting vertical direction in order to form **** 42 and to make the oilway 36 of another side in the pars intermedia material 13 and the oilway 15 of another side in a cam shaft 3 open for free passage, and **** 44 are formed.

[0037] In *(ing) and adjusting the actuation timing of an induction-exhaust valve to a tooth-lead-angle side The spool 20 is operated with the oil control valve 12. As an arrow head shows to drawing 3 , after supplying oil pressure to this order through each elements 24, 33, 34, 41, 42, and 14 at the valve timing adjustment device 4 Return oil is flowed back in a cylinder head cover 1 through the path clearance 45 (refer to drawing 2) between each elements 15, 44, 43, 36, 35, 25, 27, and 17 and opening 16, and the pars intermedia material 13 in this order. In adjusting the actuation timing of an induction-exhaust valve to a lag side, it operates the spool 20 with the oil control valve 12. As an arrow head shows to drawing 4 , after supplying oil pressure to this order through each elements 25, 35, 36, 43, 44, and 15 at the valve

timing adjustment device 4 Return oil is constituted that it should flow back in a cylinder head cover 1 through each elements 14, 42, 41, 34, 33, 24, 26, 17, and 45 in this order. In addition, as for BURAGU for processing hole lock out in 47 and 48, and 49, in drawing 3 and drawing 4 , a timing belt and 50 are belt covers.

[0038] Thus, an operation of an internal combustion engine's constituted adjustable valve timing equipment is explained below. The oil pressure from the oil gallery in a cylinder block reaches the oil path in the union bolt 9 through the oil joint 8 by the side of the oil joint 6 shown in drawing 1 , an oil pipe 7, and a valve case 11, and is supplied to the oil control valve 12 through an oil filter 10 from this oil path.

[0039] Then, the valve timing adjustment device 4 is supplied through the oil pressure path which shows oil pressure to drawing 3 by the arrow head by spool actuation of the oil control valve 12, and if the rotation phase of a cam shaft 3 and the cam pulley 5 formed in this end periphery is changed, the actuation timing of an induction-exhaust valve can be adjusted to a lag side.

[0040] Moreover, the valve timing adjustment device 4 is supplied through the oil pressure path which shows oil pressure to drawing 4 by the arrow head by spool actuation of the oil control valve 12, and if the rotation phase of a cam shaft 3 and the cam pulley 5 formed in this end periphery is changed, the actuation timing of an induction-exhaust valve can be adjusted to a lag side.

[0041] Thus, the above-mentioned valve timing adjustment device 4 With the oil pressure which circulates the inside of a cam shaft 3, change the rotation phase of the cam pulley 5 and cam shaft 3 which were prepared in the periphery of a cam shaft 3, and the actuation timing of a bulb (induction-exhaust valve) is adjusted. Although the oil control valve 12 prepared in the oil pressure path over this valve timing adjustment device 4 controls oil pressure and adjusts valve timing Form opening 16 in the upper wall of a cylinder head cover 1, and this opening 16 is covered from the top-face side of a cylinder head cover 1 by the above-mentioned valve case 11. Since the oilways 14, 15, 24, 25, 33, 34, 35, 36, 41, and 43 (above all 33 to oilway 36 reference) which open for free passage the oil control valve 12 contained by the valve case 11 and the above-mentioned valve timing adjustment device 4 using opening 16 were formed Installation of the oil control valve 12 can be performed without enlarging this cylinder head cover 1 in any way, when the space in a cylinder head cover 1 is narrow.

[0042] The above-mentioned opening 16 by the valve case 11 moreover, by that of a wrap, from the top-face side of a cylinder head cover 1 Since seal nature can be secured and the oilway free passage of the oil control valve 12 and the valve timing adjustment device 4 is moreover carried out using the above-mentioned opening 16 Management of oilways 14, 15, 24, 25, 33, 34, 35, 36, 41, and 43 becomes easy, and it is effective in the ability to attain miniaturization of an oil pressure response disposition top and a cylinder head cover 1 for this reason.

[0043] In addition, since the above-mentioned valve case 11 is arranged corresponding to the upper part of the cam cap 2 which supports a cam shaft 3 to revolve and ** was made to open the oil control valve 12 and the oilways 41 and 42 in the cam cap 2 for free passage, die-length compaction of an oilway is aimed at and it is effective in the ability to raise oil pressure responsibility further at this rate.

[0044] Furthermore, since the fit-in section 23 which fits in the lobe 32 of the oilway configuration member (pars intermedia material 13 reference) prepared in the cam cap 2 was formed in the inferior-surface-of-tongue side of a valve case 11 The positioning nature of an oilway configuration member (pars intermedia material 13 reference) and a valve case 11 is securable with these both 32 and 23. Moreover, since the oil control valve 12 and the oilways 33-36 in an oilway configuration member (pars intermedia material 13 reference) are made to open for free passage under a **** configuration, there is effectiveness it is ineffective to the seal nature between the oilway being easy.

[0045] Moreover, since the oil control valve 12 and the above-mentioned fit-in section 23 were installed in accordance with the upper wall configuration with a cylinder head cover 1 in the above-mentioned valve case 11, it is effective in the ability to attain miniaturization of the height direction of a valve case 11.

[0046] In addition, since the above-mentioned oilway configuration member (pars intermedia material 13 reference) is arranged on the top face of the cam cap 2 and the oilways 41 and 43 in the cam cap 2 and the oilways 34 and 36 in an oilway configuration member (pars intermedia material 13 reference)

were made to open for free passage Large compaction of the die length of the whole oilway which opens the oil control valve 12 and the valve timing adjustment device 4 for free passage through the inside of a cam shaft 3 can be aimed at, and it is effective in the ability to raise oil pressure responsibility further.

[0047] Moreover, since the above-mentioned valve timing adjustment device 4 was formed in the end side of a cam shaft 3 and the above-mentioned valve case 11 has been arranged to the arrangement [of this valve timing adjustment device 4], and ** side on the top face of a cylinder head cover 1, shortest-ization of oilway die length can be attained and it is effective in the ability to raise oilway responsibility further.

[0048] Furthermore, the drain paths 26 and 27 of the oil control valve 12 are established in the inferior surface of tongue of a valve case 11. The drain receptacle section 17 is formed in these drain paths 26 and 27 and the cylinder head cover 1 which counters. Since the oil (return oil) of the drain receptacle section 17 was constituted through the path clearance 45 (refer to drawing 2) between the above-mentioned opening 16 and an oilway configuration member (pars intermedia material 13 reference) that it should flow back in a cylinder head cover 1 While being able to make return oil (drain) flow back smoothly, the above-mentioned opening 16 is accomplished with necessary minimum opening, and it is effective in the ability to plan a seal disposition top.

[0049] In the configuration of this invention, and correspondence with an above-mentioned example the cam shaft of this invention It corresponds to the cam shaft 3 of an example. Like the following an oilway It corresponds to the oilways 14 and 15 in a cam shaft 3, the oilways 24 and 25 in a valve case 11, the oilways 33-36 in the pars intermedia material 13, and the oilways 41 and 43 in the cam cap 2. An oilway configuration member ** corresponding to the pars intermedia material 13 and this invention are not limited only to the configuration of an above-mentioned example.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the adjustable valve timing equipment of an internal combustion engine which the rotation phase of the cam pulley and cam shaft which were prepared in the periphery of a cam shaft is changed, and adjusts the actuation timing of a bulb (induction-exhaust valve) to a tooth-lead-angle or lag side with the actuation load of the oil pressure which circulates for example, the inside of a cam shaft.

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PRIOR ART

[Description of the Prior Art] Conventionally, as an above-mentioned internal combustion engine's adjustable valve timing equipment, the equipment of a publication is in JP,8-4510,A. Namely, oil pressure which circulates the inside of a cam shaft It is adjustable valve-timing equipment of the internal combustion engine which was formed into the oil-pressure path over the valve timing adjustment device in_ which change the rotation phase of the timing pulley and cam shaft which were prepared in the periphery of a cam shaft, and the actuation timing of a bulb (induction-exhaust valve) is adjusted, and this valve timing adjustment device, had the oil control valve which controls oil pressure and adjusts valve timing, and installed the above-mentioned oil control valve in the cylinder head cover on the cam cap top face.

[0003] When the space in an above-mentioned cylinder head cover was large enough, the oil control valve could be contained in the cylinder head cover like ****, but generally, when the space in a cylinder head cover was narrow, it was difficult to contain an oil control valve in this covering and it tended to contain the above-mentioned oil control valve in the cylinder head cover for this reason, the cylinder head cover needed to be enlarged, the space for oil control-valve receipt needed to be secured, and there was a trouble which a cylinder head cover enlarges.

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EFFECT OF THE INVENTION

[Function and Effect of the Invention] According to invention of this invention according to claim 1, it is an above-mentioned valve timing adjustment device, Although the actuation timing of a bulb (induction-exhaust valve) is adjusted, the oil control valve prepared in the oil pressure path over this valve timing adjustment device controls oil pressure and valve timing is adjusted Form opening in the upper wall of a cylinder head cover, and this opening is covered from a cylinder head cover top-face side by the above-mentioned valve case. Since the oilway which opens for free passage the oil control valve contained by the valve case and an above-mentioned valve timing adjustment device using above-mentioned opening was prepared Installation of an oil control valve can be performed without enlarging this cylinder head cover in any way, when the space in a cylinder head cover is narrow.

[0019] Moreover, since above-mentioned opening can be secured by the valve case, seal nature can be secured from a cylinder head cover top-face side by that of a wrap and the oilway free passage of an oil control valve and the valve timing adjustment device is moreover carried out using above-mentioned opening, management of an oilway becomes easy and it is effective in the ability to attain miniaturization of an oil pressure response disposition top and a cylinder head cover for this reason.

[0020] Since according to invention of this invention according to claim 2 it combined with the effect of the invention of the claim 1 above-mentioned publication, the above-mentioned valve case is arranged corresponding to the upper part of the cam cap which supports a cam shaft to revolve and ** was made to open an oil control valve and the oilway in a cam cap for free passage, die-length compaction of an oilway is aimed at and it is effective in the ability to raise oil pressure responsibility further at this rate.

[0021] Since the fit-in section which fits in the lobe of the oilway configuration member which combined with the effect of the invention of the claim 2 above-mentioned publication, and was prepared in the cam cap was prepared in the valve-case inferior-surface-of-tongue side according to invention of this invention according to claim 3, Since the positioning nature of an oilway configuration member and a valve case can be secured and an oil control valve and the oilway in an oilway configuration member are made to open for free passage under a **** configuration, there is effectiveness it is ineffective to the seal nature between the oilway being easy.

[0022] Since according to invention of this invention according to claim 4 it combined with the effect of the invention of the claim 3 above-mentioned publication and an oil control valve and the above-mentioned fit-in section were installed in accordance with the upper wall configuration with a cylinder head cover in the above-mentioned valve case, it is effective in the ability to attain miniaturization of the height direction of a valve case.

[0023] Since according to invention of this invention according to claim 5 it combined with the effect of the invention above-mentioned claim 3 or given in four, the above-mentioned oilway configuration member is arranged on the top face of a cam cap and the oilway in a cam cap and the oilway in an oilway configuration member were made to open for free passage, Large compaction of the die length of the whole oilway which opens an oil control valve and a valve timing adjustment device for free passage through the inside of a cam shaft can be aimed at, and it is effective in the ability to raise oil pressure responsibility further.

[0024] Since according to invention of this invention according to claim 6 it combined with the effect of the invention above-mentioned claims 1, 2, 3, and 4 or given in five, the above-mentioned valve timing

adjustment device in which the rotation phase of the cam pulley and cam shaft which were prepared in the periphery of a cam shaft was changed was prepared in the end side of a cam shaft and the above-mentioned valve case has been arranged to the arrangement [of this valve timing adjustment device], and ** side on the cylinder head cover top face Shortest-ization of oilway die length can be attained and it is effective in the ability to raise oilway responsibility further.

[0025] According to invention of this invention according to claim 7, it combines with an effect of the invention above-mentioned claims 3, 4, and 5 or given in six. The drain path of an oil control valve is established in the inferior surface of tongue of a valve case. Since the drain receptacle section was formed in this drain path and the cylinder head cover which counters and the oil of the drain receptacle section was constituted through the path clearance between above-mentioned opening and an oilway configuration member that it should flow back in a cylinder head cover While being able to make return oil (drain) flow back smoothly Above-mentioned opening is accomplished with necessary minimum opening, and it is effective in the ability to plan a seal disposition top.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Above-mentioned opening by the valve case which invention of this invention according to claim 1 formed opening in the upper wall of a cylinder head cover, and contained the oil control valve with a wrap from a cylinder head cover top-face side By forming the oilway which opens an oil control valve and a valve timing adjustment device for free passage using this opening Installation of an oil control valve can be performed without enlarging this cylinder head cover in any way, even if it is, when the space in a cylinder head cover is narrow. Moreover, in management of an oilway (oil path) becoming easy, it aims at offer of the adjustable valve timing equipment of the internal combustion engine which can attain miniaturization of an oil pressure response disposition top and a cylinder head cover.

[0005] Invention of this invention according to claim 2 combines with the purpose of invention of the claim 1 above-mentioned publication, arranges a valve case corresponding to the upper part of the cam cap which supports a cam shaft to revolve, by making an oil control valve and the oilway formed in the cam cap open for free passage, aims at die-length compaction of an oilway, and aims at offer of the adjustable valve timing equipment of the internal combustion engine which can raise oil pressure responsibility further.

[0006] Invention of this invention according to claim 3 combines with the purpose of invention of the claim 2 above-mentioned publication. By preparing the oilway configuration member which penetrates above-mentioned opening and projects in a cam cap, preparing the fit-in section which fits in the lobe of an oilway configuration member in the inferior-surface-of-tongue side of a valve case, and making an oil control valve and the oilway in an oilway configuration member open for free passage It aims at offer of the adjustable valve timing equipment of the internal combustion engine which can secure the positioning nature of an oilway configuration member and a valve case by both above-mentioned lobe and fit-in section.

[0007] Invention of this invention according to claim 4 combines with the purpose of invention of the claim 3 above-mentioned publication, and aims at offer of the adjustable valve timing equipment of the internal combustion engine which can attain miniaturization of the height direction by installing an oil control valve and the above-mentioned fit-in section in accordance with the upper wall configuration of a cylinder head cover in an above-mentioned valve case.

[0008] Invention of this invention according to claim 5 combines with the purpose of invention above-mentioned claim 3 or given in four, arranges an above-mentioned oilway configuration member on the top face of a cam cap, by making the oilway in a cam cap, and the oilway in an oilway configuration member open for free passage, aims at large die-length compaction of an oilway, and aims at offer of the adjustable valve timing equipment of the internal combustion engine which can raise oil pressure responsibility further.

[0009] Invention of this invention according to claim 6 combines with the purpose of invention above-mentioned claims 1, 2, 3, and 4 or given in five. By preparing an above-mentioned valve timing adjustment device in the end side of a cam shaft, and arranging an above-mentioned valve case to the same side as the arrangement side of this valve timing adjustment device Shortest-ization of oilway die length is attained and it aims at offer of the adjustable valve timing equipment of the internal combustion engine which can raise oil pressure responsibility further.

[0010] Invention of this invention according to claim 7 combines with the purpose of invention above-mentioned claims 3, 4, and 5 or given in six. The drain path (return path) of an oil control valve is established in a valve-case inferior surface of tongue. Form the drain receptacle section in this drain path and the cylinder head cover which counters, and the oil of the drain receptacle section with constituting that it should flow back in a cylinder head cover through the path clearance between above-mentioned opening and an oilway configuration member While being able to make return oil (drain) flow back smoothly, it aims at offer of the adjustable valve timing equipment of the internal combustion engine which can accomplish above-mentioned opening with necessary minimum opening.

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MEANS

[Means for Solving the Problem] The valve timing adjustment device in which invention of this invention according to claim 1 adjusts the actuation timing of a bulb, It is adjustable valve timing equipment of the internal combustion engine having the oil control valve which is prepared in the oil pressure path over the above-mentioned valve timing adjustment device, controls oil pressure, and adjusts valve timing. The above-mentioned opening by the valve case which formed opening in the upper wall of a cylinder head cover, and contained the above-mentioned oil control valve with a wrap from a cylinder head cover top-face side Valve timing equipment of the internal combustion engine with which the oilway which opens an oil control valve and a valve timing adjustment device for free passage using the above-mentioned opening was formed.

[0012] Invention of this invention according to claim 2 combines with the configuration of invention of the claim 1 above-mentioned publication, the above-mentioned valve case is arranged corresponding to the upper part of the cam cap which the actuation timing of the above-mentioned bulb is adjusted with the oil pressure which circulates a cam shaft, and supports the above-mentioned cam shaft to revolve, and it carries out that it is adjustable valve-timing equipment of the internal combustion engine which made the above-mentioned oil control valve and the oilway formed in the cam cap open for free passage as the description.

[0013] Invention of this invention according to claim 3 combines with the configuration of invention of the claim 2 above-mentioned publication, the oilway configuration member which penetrates the above-mentioned opening on the above-mentioned cam cap, and projects is prepared, the fit-in section by which the lobe of the above-mentioned oilway configuration member is fitted in the inferior-surface-of-tongue side of the above-mentioned valve case prepares, and it carries out that it is adjustable valve-timing equipment of the internal combustion engine which made the oil control valve and the oilway in an oilway configuration member open for free passage as the description.

[0014] Invention of this invention according to claim 4 combines with the configuration of invention of the claim 3 above-mentioned publication, and is characterized by being adjustable valve timing equipment of the internal combustion engine with which an oil control valve and the above-mentioned fit-in section were put side by side in accordance with the upper wall configuration of a cylinder head cover in the above-mentioned valve case.

[0015] It combines with the configuration of invention above-mentioned claim 3 or given in four, the above-mentioned oilway configuration member is arranged on the top face of a cam cap, and invention of this invention according to claim 5 is characterized by being adjustable valve timing equipment of the internal combustion engine which made the oilway and the oilway of an oilway configuration member open for free passage in a cam cap.

[0016] It combines with the configuration of invention above-mentioned claims 1, 2, 3, and 4 or given in five, the valve-timing adjustment device in which the rotation phase of the cam pulley and cam shaft which were prepared in the periphery of the above-mentioned cam shaft is changed is prepared in the end side of a cam shaft, and invention of this invention according to claim 6 is characterized by to be adjustable valve-timing equipment of the internal combustion engine with which the above-mentioned valve case has been arranged at the arrangement [of this valve timing adjustment device], and ** side.

[0017] Invention of this invention according to claim 7 combines with the configuration of invention

above-mentioned claims 3, 4, and 5 or given in six, establishes the drain path of an oil control valve in a valve-case inferior surface of tongue, forms the drain receptacle section in the above-mentioned drain path and the cylinder head cover which counters, and is characterized by to be adjustable valve-timing equipment of the internal combustion engine which flows back the oil of the drain receptacle section in the cylinder head or covering through the path clearance between the above-mentioned opening and an oilway configuration member.

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EXAMPLE

[Example] One example of this invention is explained in full detail based on a drawing below. The drawing showed an internal combustion engine's adjustable valve timing equipment, formed the cam shaft 3 supported to revolve with the cam cap 2 in the interior of a cylinder head cover 1 in drawing 1 , drawing 2 , drawing 3 , and drawing 4 , and as shown in drawing 3 and drawing 4 , it has formed the valve timing adjustment device 4 in the end side of this cam shaft 3.

[0027] With the actuation load of the oil pressure which circulates the inside of a cam shaft 3, this valve timing adjustment device 4 changes the rotation phase of the cam pulley 5 (timing pulley) and cam shaft 3 which were prepared in the end section periphery of a cam shaft 3, and adjusts the actuation timing of a bulb (induction-exhaust valve) to a tooth-lead-angle or lag side.

[0028] The path in the oil joint 6 which shows above-mentioned oil pressure to drawing 1 from the oil gallery in a cylinder block (not shown), an oil pipe 7, the oil joint 8, and the union bolt 9 shown in drawing 3 , It results in the drive type oil control valve 12. the electromagnetism contained by the valve case 11 through the oil filter 10 -- After an oil pressure control (flow rate directional control) is carried out with this oil control valve 12 A cam shaft 3 is supplied through the pars intermedia material 13 (the so-called adapter) and cam KYABBU 2 as an oilway configuration member, and the valve timing adjustment device 4 is supplied through the oilways 14 and 15 formed in this cam shaft 3.

[0029] Since the valve case 11 which contained the above-mentioned oil control valve 12 in this example is arranged on the top face of a cylinder head cover 1 at an arrangement [of the valve timing adjustment device 4], and ** side, opening 16 is formed as shown in the cam cap 2 of this cylinder head cover 1, and the upper wall which counters at drawing 2 and drawing 3 .

[0030] Moreover, the drain receptacle section 17 prolonged in the upper part side of the cam pulley 5 following opening 16 is really formed in the above-mentioned cylinder head cover 1, and the annular bearing surface 18 is formed in the top deck side of a cylinder head cover 1 so that these openings 16 and the drain receptacle section 17 may be surrounded. The valve case 11 fixed to this bearing surface 18 by using four set bolt 19 -- is constituted as shown in drawing 5 and drawing 6 .

[0031] That is, the spool arrangement hole 21 which contains the spool 20 of the oil control valve 12 possible [sliding] into the central part of a valve case 11 is formed in the direction between cam shafts, and the inlet hole 22 is formed so that it may intersect perpendicularly with this spool arrangement hole 21. As shown in this inlet hole 22 at drawing 3 and drawing 4 , the union bolt 9 and an oil filter 10 are installed inside. Moreover, it is formed in the anti-inlet hole side which separated the spool arrangement hole 21 of the above-mentioned valve case 11 that the fit-in section 23 prolonged in the vertical direction should carry out opening to an inferior-surface-of-tongue side, and this fit-in section 23 and the spool arrangement hole 21 are installed in the direction of a cam shaft in accordance with the upper wall configuration of a cylinder head cover 1.

[0032] And while two oilways 24 and 25 which open the above-mentioned fit-in section 23 and the above-mentioned spool arrangement hole 21 for free passage are formed, two drain paths 26 and 27 of the oil control valve 12 are formed in the lower part of the spool arrangement hole 21, and each of these drain paths 26 and 27 counter with the above-mentioned drain receptacle section 17. Moreover, the mounting eye 28 is formed in the base of the above-mentioned valve case 11 so that it may correspond with the bearing surface 18 of a cylinder head cover 1, and the above-mentioned opening 16 is covered

from the top-face side of a cylinder head cover 1 by this valve case 11 that contained the oil control valve 12. In addition, in drawing 5 and drawing 6 , 29 is a through tube for making the above-mentioned set bolt 19 insert in.

[0033] On the other hand, as shown also in drawing 7 , the reverse T character-like pars intermedia material 13 is arranged on the top face of the above-mentioned cam cap 2 using two set bolts 30 and 30. As that oilway configuration section 31 shows this pars intermedia material 13 to drawing 3 and drawing 4 , the lobe 32 which penetrated the opening 16 of a cylinder head cover 1, and was projected up more nearly up than a projection and this opening 16 is fitted in the fit-in section 23 of a valve case 11.

[0034] This pars intermedia material 13 is equipped with the sideways oilway 33 which is open for free passage to one oilway 24 (refer to drawing 3 and drawing 5) of a valve case 11 as shown in drawing 7 , drawing 8 , drawing 9 , and drawing 10 , the oilway 34 which is open for free passage to this oilway 33, and is prolonged in the vertical direction, the sideways oilway 35 which is open for free passage to the oilway 25 (refer to drawing 4 and drawing 5) of another side of a valve case 11, and the oilway 36 which is open for free passage to this oilway 35, and is prolonged in a slanting lower part.

[0035] Moreover, the O ring arrangement sections 37 and 38 as a seal member are formed in the lower region outside periphery of the part in which the oilways 33 and 35 sideways [above-mentioned] were formed, and as shown in these O ring each arrangement sections 37 and 38 at drawing 3 and drawing 4 , O rings 39 and 39 are arranged. In addition, in drawing 8 and drawing 10 , 40 is a through tube for making the above-mentioned set bolt 30 insert in.

[0036] On the other hand on the cam cap 2 which supports the above-mentioned cam shaft 3 to revolve The oilway 41 prolonged in the vertical direction in order to make one oilway 34 in the pars intermedia material 13, and one oilway 14 in a cam shaft 3 open for free passage as shown in drawing 3 , drawing 4 , and drawing 11 , The oilway 43 prolonged in the slanting vertical direction in order to form **** 42 and to make the oilway 36 of another side in the pars intermedia material 13 and the oilway 15 of another side in a cam shaft 3 open for free passage, and **** 44 are formed.

[0037] In *(ing) and adjusting the actuation timing of an induction-exhaust valve to a tooth-lead-angle side The spool 20 is operated with the oil control valve 12. As an arrow head shows to drawing 3 , after supplying oil pressure to this order through each elements 24, 33, 34, 41, 42, and 14 at the valve timing adjustment device 4 Return oil is flowed back in a cylinder head cover 1 through the path clearance 45 (refer to drawing 2) between each elements 15, 44, 43, 36, 35, 25, 27, and 17 and opening 16, and the pars intermedia material 13 in this order. In adjusting the actuation timing of an induction-exhaust valve to a lag side, it operates the spool 20 with the oil control valve 12. As an arrow head shows to drawing 4 , after supplying oil pressure to this order through each elements 25, 35, 36, 43, 44, and 15 at the valve timing adjustment device 4 Return oil is constituted that it should flow back in a cylinder head cover 1 through each elements 14, 42, 41, 34, 33, 24, 26, 17, and 45 in this order. In addition, as for BURAGU for processing hole lock out in 47 and 48, and 49, in drawing 3 and drawing 4 , a timing belt and 50 are belt covers.

[0038] Thus, an operation of an internal combustion engine's constituted adjustable valve timing equipment is explained below. The oil pressure from the oil gallery in a cylinder block reaches the oil path in the union bolt 9 through the oil joint 8 by the side of the oil joint 6 shown in drawing 1 , an oil pipe 7, and a valve case 11, and is supplied to the oil control valve 12 through an oil filter 10 from this oil path.

[0039] Then, the valve timing adjustment device 4 is supplied through the oil pressure path which shows oil pressure to drawing 3 by the arrow head by spool actuation of the oil control valve 12, and if the rotation phase of a cam shaft 3 and the cam pulley 5 formed in this end periphery is changed, the actuation timing of an induction-exhaust valve can be adjusted to a lag side.

[0040] Moreover, the valve timing adjustment device 4 is supplied through the oil pressure path which shows oil pressure to drawing 4 by the arrow head by spool actuation of the oil control valve 12, and if the rotation phase of a cam shaft 3 and the cam pulley 5 formed in this end periphery is changed, the actuation timing of an induction-exhaust valve can be adjusted to a lag side.

[0041] Thus, the above-mentioned valve timing adjustment device 4 With the oil pressure which

circulates the inside of a cam shaft 3, change the rotation phase of the cam pulley 5 and cam shaft 3 which were prepared in the periphery of a cam shaft 3, and the actuation timing of a bulb (induction-exhaust valve) is adjusted. Although the oil control valve 12 prepared in the oil pressure path over this valve timing adjustment device 4 controls oil pressure and adjusts valve timing Form opening 16 in the upper wall of a cylinder head cover 1, and this opening 16 is covered from the top-face side of a cylinder head cover 1 by the above-mentioned valve case 11. Since the oilways 14, 15, 24, 25, 33, 34, 35, 36, 41, and 43 (above all 33 to oilway 36 reference) which open for free passage the oil control valve 12 contained by the valve case 11 and the above-mentioned valve timing adjustment device 4 using opening 16 were formed Installation of the oil control valve 12 can be performed without enlarging this cylinder head cover 1 in any way, when the space in a cylinder head cover 1 is narrow.

[0042] The above-mentioned opening 16 by the valve case 11 moreover, by that of a wrap, from the top-face side of a cylinder head cover 1 Since seal nature can be secured and the oilway free passage of the oil control valve 12 and the valve timing adjustment device 4 is moreover carried out using the above-mentioned opening 16 Management of oilways 14, 15, 24, 25, 33, 34, 35, 36, 41, and 43 becomes easy, and it is effective in the ability to attain miniaturization of an oil pressure response disposition top and a cylinder head cover 1 for this reason.

[0043] In addition, since the above-mentioned valve case 11 is arranged corresponding to the upper part of the cam cap 2 which supports a cam shaft 3 to revolve and ** was made to open the oil control valve 12 and the oilways 41 and 42 in the cam cap 2 for free passage, die-length compaction of an oilway is aimed at and it is effective in the ability to raise oil pressure responsibility further at this rate.

[0044] Furthermore, since the fit-in section 23 which fits in the lobe 32 of the oilway configuration member (pars intermedia material 13 reference) prepared in the cam cap 2 was formed in the inferior-surface-of-tongue side of a valve case 11 The positioning nature of an oilway configuration member (pars intermedia material 13 reference) and a valve case 11 is securable with these both 32 and 23. Moreover, since the oil control valve 12 and the oilways 33-36 in an oilway configuration member (pars intermedia material 13 reference) are made to open for free passage under a **** configuration, there is effectiveness it is ineffective to the seal nature between the oilway being easy.

[0045] Moreover, since the oil control valve 12 and the above-mentioned fit-in section 23 were installed in accordance with the upper wall configuration with a cylinder head cover 1 in the above-mentioned valve case 11, it is effective in the ability to attain miniaturization of the height direction of a valve case 11.

[0046] In addition, since the above-mentioned oilway configuration member (pars intermedia material 13 reference) is arranged on the top face of the cam cap 2 and the oilways 41 and 43 in the cam cap 2 and the oilways 34 and 36 in an oilway configuration member (pars intermedia material 13 reference) were made to open for free passage Large compaction of the die length of the whole oilway which opens the oil control valve 12 and the valve timing adjustment device 4 for free passage through the inside of a cam shaft 3 can be aimed at, and it is effective in the ability to raise oil pressure responsibility further.

[0047] Moreover, since the above-mentioned valve timing adjustment device 4 was formed in the end side of a cam shaft 3 and the above-mentioned valve case 11 has been arranged to the arrangement [of this valve timing adjustment device 4], and ** side on the top face of a cylinder head cover 1, shortest-ization of oilway die length can be attained and it is effective in the ability to raise oilway responsibility further.

[0048] Furthermore, the drain paths 26 and 27 of the oil control valve 12 are established in the inferior surface of tongue of a valve case 11. The drain receptacle section 17 is formed in these drain paths 26 and 27 and the cylinder head cover 1 which counters. Since the oil (return oil) of the drain receptacle section 17 was constituted through the path clearance 45 (refer to drawing 2) between the above-mentioned opening 16 and an oilway configuration member (pars intermedia material 13 reference) that it should flow back in a cylinder head cover 1 While being able to make return oil (drain) flow back smoothly, the above-mentioned opening 16 is accomplished with necessary minimum opening, and it is effective in the ability to plan a seal disposition top.

[0049] In the configuration of this invention, and correspondence with an above-mentioned example the cam shaft of this invention It corresponds to the cam shaft 3 of an example. Like the following an

oilway It corresponds to the oilways 14 and 15 in a cam shaft 3, the oilways 24 and 25 in a valve case 11, the oilways 33-36 in the pars intermedia material 13, and the oilways 41 and 43 in the cam cap 2. An oilway configuration member ** corresponding to the pars intermedia material 13 and this invention are not limited only to the configuration of an above-mentioned example.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The top view showing the adjustable valve timing equipment of the internal combustion engine of this invention.

[Drawing 2] The important section expansion top view of drawing 1 shown where a valve case and an oil control valve are omitted.

[Drawing 3] The important section expanded sectional view which meets the A-A line of drawing 1.

[Drawing 4] The sectional view showing other actuation timing of the induction-exhaust valve by the valve timing adjustment device.

[Drawing 5] The plane view Fig. in which carrying out the cross section of the important section of a valve case, and showing it.

[Drawing 6] The bottom view of a valve case.

[Drawing 7] The explanatory view of the cam cap which meets the B-B line of drawing 1, and pars intermedia material.

[Drawing 8] The plane view Fig. in which carrying out the cross section of the important section of pars intermedia material, and showing it.

[Drawing 9] The side elevation of pars intermedia material.

[Drawing 10] The C-C line view sectional view of drawing 8.

[Drawing 11] The expanded sectional view of a cam cap.

[Description of Notations]

- 1 -- Cylinder head cover
- 2 -- Cam cap
- 3 -- Cam shaft (cam shaft)
- 4 -- Valve timing adjustment device
- 5 -- Cam pulley
- 11 -- Valve case
- 12 -- Oil control valve
- 13 -- Pars intermedia material (oilway configuration member)
- 14 15 -- Oilway
- 16 -- Opening
- 17 -- Drain receptacle section
- 23 -- Fit-in section
- 24 25 -- Oilway
- 26 27 -- Drain path
- 32 -- Lobe
- 33-36 -- Oilway
- 41 43 -- Oilway
- 45 -- Path clearance

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